



# Fibre Channel

Historically most system integrators looking to build high-speed network file servers have looked to SCSI as the medium of choice for reliable high-speed storage. This may be changing with the emergence of Fibre Channel, a storage and network transport protocol with the flexibility to be useful anywhere that high-speed networking and storage are needed.

Fibre Channels' name is slightly deceptive. Although it sounds as if it is restricted to optical fiber it is in fact a standard that can be implemented using either copper or optical cabling.

Fibre Channel has two key advantages over other network mediums: speed and flexibility. Fibre Channel is protocol independent and supports data rates of 133 Mbits/second, 266 Mbits/second, 531 Mbits/second and 1.062 Gbits/second (or 12.5, 25, 50, and 100 Mbytes/second), more than double the speed of the fastest SCSI. Using optical cabling, devices may be connected up to six miles apart, compared with a few feet with SCSI, thereby eliminating the problems associated with distance and location.

## Hardware and Topologies

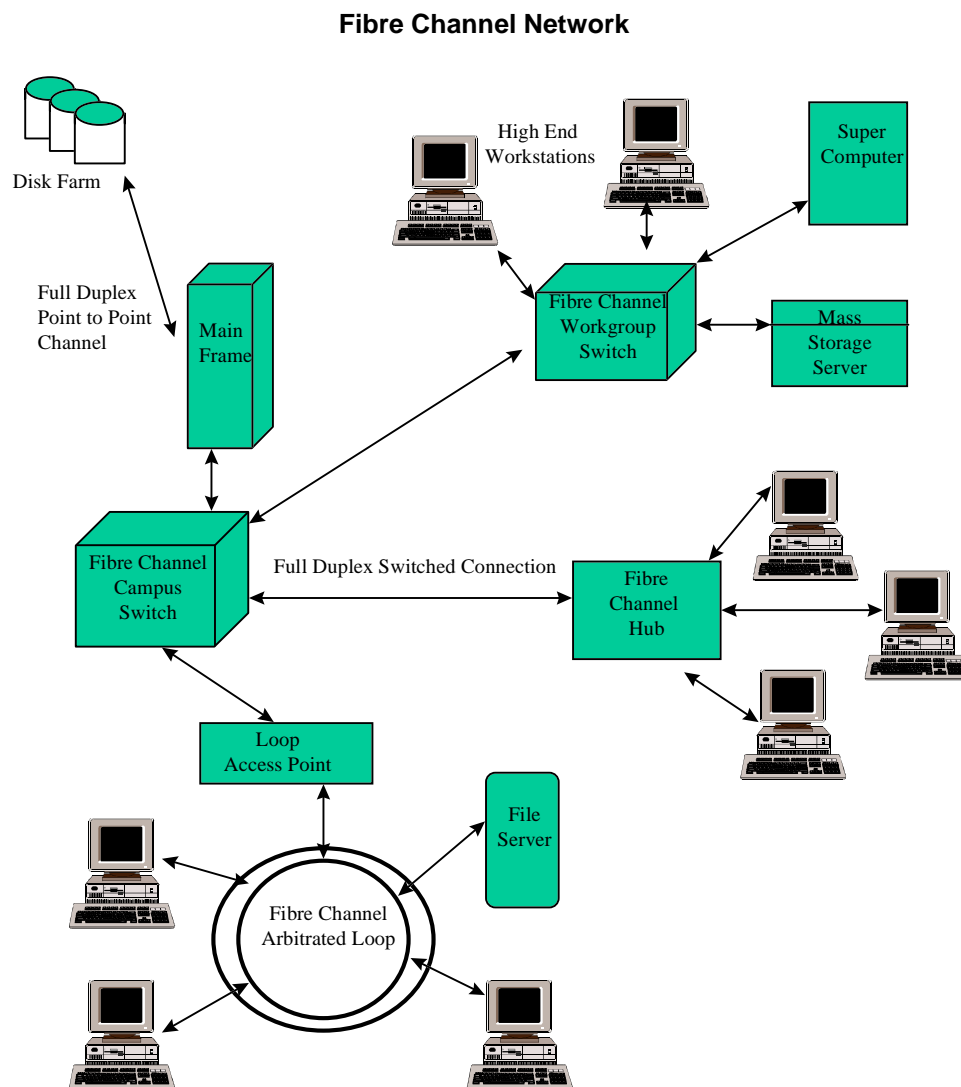
Physically Fibre Channel uses two pairs of wires, one pair for sending and the other pair for receiving, both of which can operate simultaneously (a.k.a. Full Duplex). Shielded Twisted Pair (STP) cabling is preferred for applications using copper wire. The connector is a DB-9 style plug although some products use a high-speed serial data connector similar to an RJ-45 connector. Unshielded Twisted Pair is not supported. Copper wiring permits peripherals to be connected at distances up to 47 meters.

Fibre optic cables include the 9 micrometer single mode fibre and 50 and 62.5 micrometer multimode cabling with SCSI connectors. Optical fiber is usually reserved for long distances. Optical fiber permits peripherals to be connected at distances up to 10 kilometers apart.

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From a single connection up to 126 devices may be attached. Each of these cables supports a range of data rates and imposes specific distance limitations, but Fibre Channel can mix all of them within the same network, for example; single mode optical fibre could be used across a campus, multimode fiber could be used to distribute data throughout individual buildings, and shielded twisted pair could make connections to individual workstations.

Three topologies are supported: Point to Point, Arbitrated Loop and Fabric Switching (fibre channel switch). All topologies are interoperable and transparent. Point to Point and Loop connections require that all modes operate at the same data rate, but with switching ports, data rates are negotiable.



## Services

Like any network, most requirements for Fibre Channel networks depend on the needs of its clients. With Fibre Channel there are four classes of service which network planners and resellers need to understand.

**Service Class 1** - Class 1 is a hard-wired or circuit switched dedicated connection between two nodes that cannot be broken, similar to a telephone connection. The service provides exclusive use of the connection for as long as it is needed and is ideal for use wherever there is a need for dedicated links, such as one between server and storage.

**Service Class 2** - Class 2 is a connectionless, frame switched service that guarantees delivery with confirmation. Similar to packet switched technologies like frame relay, switching is performed on the data frame rather than on a connection, and frames are sent over any available route. This class is most like conventional networks and would be best for environments that involve a mixture of storage and network communications.

**Service Class 3** - Similar to Class 2, Class 3 is a connectionless frame switched service. Designed for one-to-many connection situations, Class 3 service contains no guarantee or confirmation mechanism. There are no retransmissions or waits for acknowledgment, thereby resulting in performance gains. Class 3 is ideal for storage, which generally encompasses its own confirmation protocol.

**Service Class 4** - Class 4 is a connection-based service that offers guaranteed fractional bandwidth and guaranteed latency levels. In this class users are able to lock down specific paths through a Fibre Channel switch (also known as a Fabric). Class 4 supports isochronous service that can carry real time video and video traffic as well as data. High definition video requires consistent latency and minimum jitter without buffering which only isochronous service can provide.

## The Fibre Channel Market

The high speed capability and low latency of Fibre Channel makes it ideal for applications which require large data transfers such as systems dedicated to imaging, 3-D rendering, video production and large data mining applications. Manufacturers are also offering Fibre Channel switches (known as Fabrics) and adapters as a total solution to storage and networking.

Analysts believe the market is ready for Fibre Channel. By some predictions, Fibre Channel controller board revenue will reach one billion dollars (U.S.) in 1998 compared with 50 million dollars in 1997. Manufactures are positioning their products largely toward the server and RAID markets as a high-speed alternative to SCSI. High speed SCSI is seen as an evolutionary step toward Fibre Channel, with SCSI sales peaking in 1998 and being surpassed by Fibre Channel by the year 2000 (ref. *Computer Reseller News*, “Fibre Channel blazes path to fast storage...” Nov.10, 1997).

## Conclusion

The key to Fibre Channel is its speed and flexibility. It combines the almost unbeatable combination of high speed and low overhead of channel connections, with the distance and cabling flexibility of networking. Fibre channel is indifferent to the type of data that is sent while maintaining compatibility with existing communications standards and protocols.

## Key Points to Remember

- Fibre Channel is protocol independent
- Cabling includes optical fiber, coax and shielded twisted pair
- Products include switches, shared media hubs, adapter cards, workstations and servers.
- Data rates range from 12.5 to 100 megabytes per second
- Distances range from 100 meters for shielded twisted pair to 10 kilometers for optical cable.
- Up to 127 connections may be made on the same hub or loop compared to a maximum 15 connections for SCSI.